INVESTIGATOR'S ANNUAL REPORT

National Park Service

All or some of the information provided may be available to the public

Reporting Year: 2002	**Park:** Glacier Bay NP & PRES
Principal Investigator: Dr Philip Hooge	**Office Phone:** 907-697-2637
	Email: philip_hooge@usgs.gov
Address: Glacier Bay Field Station P.O. Box 140 Gustavus, AK 99826 US	**Office Fax:** 907-697-2654

Additional investigator or key field assistants(first name, last name, office phone, office email

Name: Elizabeth R. Hooge	**Phone:** 907-697-2644	**Email:** elizabeth_ross_hooge@usgs.gov
Name: Lisa L. Etherington	**Phone:** 907-697-2625	**Email:** letherington@usgs.gov

Permit #:
GLBA-2001-SCI-0003

Park-assigned Study Id.#:
GLBA-00003

Study Title:
Glacier Bay Oceanographic Patterns

Permit Start Date: May 01, 2001	**Permit End Date:** Dec 31, 2010
Study Start Date: May 01, 2001	**Study End Date:** Dec 31, 2010

Study Status:
Continuing

Activity Type:
Research

Objectives:

This project involves the monitoring and analysis of within and between year oceanographic patterns along the glacial chronosequence in Glacier Bay, Alaska. Glacier Bay exhibits large spatial and temporal differences in oceanographic patterns due to complex fjord and estuarine processes, the recent history of glaciation, and large numbers of tidewater glaciers. To detect and understand anthropogenic disturbance to this marine ecosystem requires a baseline examination of the amount of spatial and temporal variability in the oceanographic properties within this fjord estuarine system, as well an understanding of the factors that are most influential in driving these patterns.

Findings and Status:

This year represented the tenth year of field sampling for this monitoring program and consisted of six surveys of twenty-four stations located throughout Glacier Bay. A sampling profile with salinity, temperature, chorophyll-a concentration (proxy for phytoplankton abundance), light penetration, and turbidity was taken at one meter intervals from surface waters to bottom depths (to 300m). In addition to continuing the monitoring program, our work on this project this year concentrated on compiling, summarizing, and analyzing all ten-year's worth of oceanographic data collected within Glacier Bay. In addition to compiling the oceanographic data for the ten years from 1993-2002, we also compiled and summarized weather data for this same time period, including air temperature, precipitation, and wind speed for eight regional stations surrounding Glacier Bay. A draft of a report that resulted from these analyses has been completed and is awaiting peer-review. Mentioned below are some of the main findings resulting from these analyses. Oceanographic characteristics of the surface waters of Glacier Bay are relatively similar from November to February, while the periods March through October represent periods of the greatest change, both spatially within the Bay as well as temporally among months. The upper-fjord regions of the Bay (farthest from marine waters and closest to glaciers) are the areas of greatest change among months of the year for all measured physical oceanographic factors (salinity, stratification, euphotic depth, turbidity) except for water temperature, which exhibits a greater range of values within the lower and central regions of the Bay. Noticeable differences in

oceanographic properties were detected between the East and West Arms of the Bay, potentially due to the large difference in the depth of the entrance sills to these upper-fjord regions that could influence the influx of marine waters into these regions. The stratification of surface waters, which is mainly determined by salinity levels, dramatically increases in May and remains relatively high through October. Patterns of salinity, and the resulting seasonal stratification patterns, appear to be largely driven by the seasonal cycle of freshwater discharge in southeast Alaska, with initial snow-melt starting in May, ice-melt during the summer, and high direct precipitation in the fall. Stratification patterns are lowest for the lower Bay region where tidal mixing is high, followed by intermediate stratification within the central Bay, and highly stratified surface waters within the upper Bay due to high levels of freshwater discharge. Average chlorophyll-a levels within the surface waters do not coincide with the large increase in surface water stratification in May, but instead, an overall increase in chlorophyll-a occurs in March, most likely as a response to an increase in available light. Concentration of chlorophyll-a increases from spring to summer and remains relatively high into the fall. Highest levels of chlorophyll-a within Glacier Bay are generally found within the central Bay and the lower reaches of the East and West Arms. These regions are likely favorable for phytoplankton populations due to intermediate stratification levels, higher light levels due to decreased sediment concentrations in the water column, nutrient regeneration to the surface waters, and lower zooplankton abundance.

For this study, where one or more specimens collected and removed from the park but not destroyed during analyses?
No

Funding provided this reporting year by NPS:	**Funding provided this reporting year by other sources:**
72000	50000

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Full name of college or university:	**Annual funding provided by NPS to university or college this reporting year:**
	0

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